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ABSTRACT

This study sought to find patterns among the relationship of the factors of substance abuse, home environment, employment during the school year, participation in school activities, and participation in activities outside of school and to confirm or deny that the patterns established for data collected and analyzed during the 1990-91 year would be reflected in the analysis of a different data set collected during the 1991-92 school year. The 1990-91 data set included the usable responses of 7,279 middle and senior high students and the 1991-92 data set included the usable response of 5,541 middle and senior high school students. The instrument utilized contained 52 items with multiple choices for each item. The use of substances surveyed included tobacco, alcohol, marijuana, and cocaine. Employment included weekend and after school jobs held during the school year. The home situation was classified as one with both parents present, a parent/step-parent environment, or a single parent or other home environment. The results of the study indicated that the students who are at risk for substance abuse have the following characteristics: (1) the student is employed during the academic year; (2) the student comes from a home environment where both parents are not present; and (3) the student is not participating in school activities. (Contains 18 tables and 7 appended graphs.) (ABL)

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A PROFILE OF STUDENTS ENGAGED IN SUBSTANCE ABUSE

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A Research Paper Presented at
The Mid-Western Educational Research Association
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A PROFILE OF STUDENTS ENGAGED IN SUBSTANCE ABUSE

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The objectives of this analysis were two fold:

1. To find patterns among the relationship of the factors of substance abuse, home environment, employment during the school year, participation in school activities and participation in activities outside of school.

2. To confirm or deny that the patterns established for data collected and analyzed during the 1990-91 year would be reflected in the analysis of a different data set collected during the 1991-92 school year.

The use of substances surveyed and reported in this paper include tobacco, alcohol, marijuana, and cocaine. Employment included week-end and after school jobs held during the academic school year. School activity participation was categorized as athletics, student government and/or clubs, music or drama, more than one category of activity participation, or lack of participation in any activity. Activity participation outside school included the categories of athletics, clubs, music or drama organizations, multiple activity participation, or lack of participation in any activity. The home situation was classified as a home environment with both parents present, a parent/step-

parent environment, or a single parent or other home environment.

The school corporations surveyed included rural and suburban schools in a midwestern state. One data set was collected during the 1990-91 school year. A different data set was collected during the 1991-92 school year. The first data set contained responses from 7426 middle school and senior high school students of which 7279 were usable. The second data set contained responses from 5639 middle school and senior high school students of which 5541 were usable.

The instrument utilized contained 52 items with multiple choices for each item. The students were asked to select the choice that represented their specific situation. Responses were kept confidential and each respondent remained anonymous.

To analyze the data, a hierarchical log-linear model was employed. A model was fit for each of the substances (tobacco, alcohol, marijuana, and cocaine) for the 1990-91 data set and then for the 1991-92 data set. This model has the form

$$\ln F_{ijkl} = u + \lambda_i + \lambda_j + \lambda_k + \lambda_l + \lambda_{ij} + \lambda_{ik} + \lambda_{il} + \lambda_{jk} + \lambda_{jl} + \lambda_{kl} + \lambda_{ijk} + \lambda_{ijl} + \lambda_{ijl} + \lambda_{jkl} + \lambda_{ijkl}$$

where F_{ijkl} is the frequency count in a particular cell in the multiway contingency table, and u is the average of the logarithms of the frequencies of all the cells in the table. The λ's represent the contribution of the level of a factor or combination of factors to this frequency count. When fitting a model, some of the λ's may be zero indicating a lack of interaction among the particular factors (except first order) represented by the λ. The hierarchical log-linear model begins

with fitting the highest order interaction and all lower order interactions and single terms, then eliminates all higher order interactions that do not contribute to the model. The final model thus contains the higher order interactions that are significant along with the lower order interactions and single terms contained in the higher order interaction. The higher order interactions that remain are called the generating class for the model. Since chi square is additive, the test for the contribution of each higher order interaction in the model is performed. Therefore, for each model presented, a table is provided indicating the significance of the effect of a particular term. The analyses for each substance involved and for each data set (8 analyses in all) were performed using the HILOG procedure of the SPSS-X statistical package SPSS release 4.1 for VAX/VMS running on a VAX using VMS version 5.5 .

The log-linear model allows one to examine whether the interaction between two of the variables has an effect in the multiway classification table when another variable may also be causing the effect . If, for example, the three variables were use of tobacco, home environment, and participation in activities outside the school, a separate chi square analysis of use of tobacco by home environment and a chi square analysis of use of tobacco by participation in activities outside of school might both be signficant. However, it may be the case that participation in activities outside of school may be very closely related to the home environment. Removing the effect of participation in outside of school activities from consideration may make the interaction between tobacco use and home environment non-significant. The log-linear model is useful in assessing this situation.

Results for Tobacco

The best fitting model for the 1990-91 data set had generating class which contained the term of substance by employment by home environment by school activities by outside activities. Therefore, all terms are present in the model. However, from Table 1A, the only third or higher order interactions that are significant are substance by school activities by outside activities (chi squre = 46.193, df = 32, p = .05) and employment by school activities by outside activities (chi square = 26.195, df = 16, p = .0513). The only second order interaction that is not significant is the employment by home environment (chi square = 1.763, df = 2, p = .4142). Thus, there does not appear to be a relationship between employment and home environment.

The best fitting model for the 1991-92 data set had a generating class which contained the terms substance by employment by home environment by school activities, substance by employment by home environment by outside activities, substance by employment by school activities by outside activities and substance by home environment by school activities by outside activities. As Table 1B indicates, all the terms involving substance are significant except for substance by home environment by outside activities (chi square = 51.539, df = 16, p = .3545).

Table 2 displays the co-efficients in the two way interactions between the substance usage and the remaining variables. It is significant to note that for both sets of data

Table 1A

Partial Chi square With Tobacco

1990-1991 Data

Effect name	DF	Partial chi sq	Prob.
Fourth Order Interactions			
sub*emp*home*sch	16	13.600	.6285
sub*emp*home*sch	16	17.058	.3819
sub*emp*sch*out	32	25.453	.7873
sub*home*sch*out	64	81.207	.0721
emp*home*sch*out	32	42.196	.1027
Third Order Interactions			
sub*emp*home	4	4.381	.3568
sub*emp*sch	8	5.698	.6811
sub*home*sch	16	20.616	.1937
emp*home*sch	8	8.061	.4275
sub*emp*out	8	14.135	.0738
sub*home*out	16	17.087	.3800
emp*home*out	8	10.630	.2236
sub*sch*out	32	46.193	.0500
emp*sch*out	16	26.195	.0513
home*sch*out	32	33.858	.3779
Second Order Interactions			
sub*emp	2	338.732	.0000
sub*hom	4	127.625	.0000
emp*hom	2	1.763	.4142
sub*sch	8	204.886	.0000
emp*sch	4	64.095	.0000
hom*sch	8	37.217	.0000
sub*out	8	160.449	.0000
emp*out	4	32.728	.0000
hom*out	8	59.700	.0000
sch*out	16	2089.427	.0000
First Order Effects			
sub	2	2135.300	.0000
emp	1	292.927	.0000
hom	2	4572.777	.0000
sch	4	1550.429	.0000
out	4	2124.507	.0000

sub = substance emp = employment hom = home environment

sch = participation in school activities

out = participation in outside activities

Table 1B

Partial Chi square With Tobacco

1991-1992 Data

Effect name	DF	Partial Chi sq	Prob.
	Fourth Order Interactions		
sub*emp*home*sch	16	29.590	.0202
sub*emp*home*sch	16	36.378	.0026
sub*emp*sch*out	32	69.012	.0002
sub*home*sch*out	64	149.064	.0000
emp*home*sch*out	32	43.140	.0903
	Third Order Interactions		
sub*emp*home	4	8.252	.0828
sub*emp*sch	8	16.520	.0355
sub*home*sch	16	43.687	.0002
emp*home*sch	8	5.125	.7441
sub*emp*out	8	30.837	.0002
sub*home*out	16	51.539	.3545
emp*home*out	8	8.857	.0004
sub*sch*out	32	66.255	.0001
emp*sch*out	16	45.696	.0000
home*sch*out	32	79.188	.0000
	Second Order Interactions		
sub*emp	2	290.050	.0000
sub*hom	4	140.731	.0065
emp*hom	2	10.080	.0000
sub*sch	8	86.876	.0000
emp*sch	4	36.515	.0000
hom*sch	8	25.624	.0012
sub*out	8	125.534	.0000
emp*out	4	31.224	.0000
hom*out	8	57.299	.0000
sch*out	16	1532.356	.0000
	First Order Effects		
sub	2	927.183	.0000
emp	1	236.645	.0000
hom	2	3273.030	.0000
sch	4	1207.744	.0000
out	4	1640.500	.0000

sub = substance emp = employment hom = home environment

sch = participation in school activities

out = participation in outside activities

the lack of employment has a positive effect on not using tobacco and that these co-efficients (.264 and .234) are significant. Therefore, employment has the opposite effect regarding tobacco use. Since the coefficient is negative for not being employed and using tobacco (-.242 for the 1990-91 data and -.261 for the 1991-92 data) the effect of not being employed lowered the predicted use of tobacco, a desirable effect, while correspondingly, the effect of being employed raised the predicted use of tobacco which should be considered as an undesirable effect. As indicated in the Table, these co-efficients were significant and the pattern is the same between the two data sets.

Similar patterns were found between the use of tobacco and the home environment for both data sets except for the parent/step-parent households. As the coefficients indicate, the respondents from the home environment where both parents are present had positive coefficients for both data sets indicating that this home environment deterred the use of tobacco. The results indicate that respondents from the single parent home environments were more likely to use tobacco.

Lack of participation in either school activities or outside activities had an effect on tobacco use. Participating in music or drama in the school setting had a desirable effect on tobacco usage, but participating in music or drama organizations outside the school setting had an undesirable effect on tobacco usage. The reverse was true for athletics: the result of participation in school athletics had an undesirable effect on tobacco usage, although this was significant only for the 1990-91 data set. However, participation in athletics outside the school setting had a desirable effect on tobacco usage. Participation

Table 2
Co-efficients for Tobacco Usage

Substance/employment

	1990-91		1991-92	
	Not emp	emp	not emp	emp
Not used	.264	-.264*	.234*	-.234*
Exp/ quit	-.022	.022	.027	-.027
Use	-.242*	.242*	-.261*	.261*

Substance/Home environment

	1990-91			1991-92		
	Parents	Parent/ step	Single Parent	Parents	Parent/ Step	Single Parent
Not used	.249*	-.074	-.175*	.334*	-.181*	-.153*
Exp/ quit	-.053	.083	-.030	-.073	.085	-.012
Use	-.196*	-.009	.205*	-.261*	.096	.165*

Substance/School activities

	1990-1991					1991-1992				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	-.178*	-.147	.306*	.214	-.195*	-.110	.088	.108	.079	-.165
Exp/ quit	.081	.028	-.083	.086	-.102	.006	-.001	.008	.059	-.072
Use	.097	.119	-.213*	-.300*	.297*	.104	-.087	-.116	-.138	.237*

Substance/Outside activities

	1990-91					1991-92				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	.139*	.118	-.222*	.139*	-.174*	.020	.080	-.051	.172*	-.221*
Exp/ quit	-.021	.007	.045	-.002	-.029	.188*	.019	-.219	-.052	.064
Use	-.118	-.125	.177*	-.137	.203*	-.208*	-.099	.270*	-.120	.157

* Significant at the .05 level

in multiple activities was desirable for the in-school and out-of-school activities. The coefficients were significant for the 1990-91 data for school activities and significant for both sets of data for out-of-school activities.

Employment, coming from a single parent home environment, and a lack of participation in activities tend to be factors present in a student who uses tobacco. It is interesting that participation in athletics outside the school environment has a desirable effect, while participation in school athletics seems to indicate an undesirable relation. This may indicate a need for coaches to stress the undesirable effects of the use of tobacco on athletic performance.

The model for the 1990-91 data is a fully saturated model, and a plot would not be meaningful. The plot of the observed frequencies with the residuals is provided in the Appendix for the 1991-92 data. This plot suggests that the model seems to fit the data.

Results for Alcohol

For the 1990-91 data the best fitting model for the variables including alcohol usage, employment, home environment, participation in school activities and participation in outside activities had in the generating class the terms substance by employment by home environment, employment by home environment by participation in outside activities, employment by participation in school activities, substance by home environment by participation in outside activities, substance by participation in school activities by participation in outside activities, and home environment by participation in school activities by

Table 3A

Partial Chi square With Alcohol

1990-1991 Data

Effect name	DF	Partial Chi sq	Prob.
	Fourth Order Interactions		
sub*emp*home*sch	16	15.440	.4927
sub*emp*home*sch	16	11.554	.7741
sub*emp*sch*out	32	32.672	.4338
sub*home*sch*out	64	81.628	.0678
emp*home*sch*out	32	36.493	.2677
	Third Order Interactions		
sub*emp*home	4	11.520	.0213
sub*emp*sch	8	10.764	.2154
sub*home*sch	16	26.743	.0444
emp*home*sch	8	6.602	.5801
sub*emp*out	8	4.481	.8113
sub*home*out	16	16.671	.4012
emp*home*out	8	13.610	.0925
sub*sch*out	32	39.128	.1803
emp*sch*out	16	21.680	.1538
home*sch*out	32	36.167	.2801
	Second Order Interactions		
sub*emp	2	436.609	.0000
sub*hom	4	98.540	.0000
emp*hom	2	2.780	.2491
sub*sch	8	140.598	.0000
emp*sch	4	65.649	.0000
hom*sch	8	52.327	.0000
sub*out	8	128.893	.0000
emp*out	4	35.541	.0000
hom*out	8	67.058	.0000
sch*out	16	2189.026	.0000
	First Order Effects		
sub	2	806.910	.0000
emp	1	294.557	.0000
hom	2	4587.587	.0000
sch	4	1543.137	.0000
out	4	2127.751	.0000

sub = substance emp = employment hom = home environment

sch = participation in school activities

out = participation in outside activities

Table 3B

Partial Chi square With Alcohol

1991-1992 Data

Effect name	DF	Partial Chi sq	Prob.
	Fourth Order Interactions		
sub*emp*home*sch	16	26.073	.0530
sub*emp*home*sch	16	20.741	.1887
sub*emp*sch*out	32	39.106	.1809
sub*home*sch*out	64	116.032	.0001
emp*home*sch*out	32	54.853	.0072
	Third Order Interactions		
sub*emp*home	4	8.837	.0653
sub*emp*sch	8	11.490	.1755
sub*home*sch	16	33.507	.0063
emp*home*sch	8	4.197	.8390
sub*emp*out	8	25.446	.0013
sub*home*out	16	47.531	.0001
emp*home*out	8	8.276	.4070
sub*sch*out	32	85.937	.0000
emp*sch*out	16	45.242	.0001
home*sch*out	32	67.783	.0002
	Second Order Interactions		
sub*emp	2	271.329	.0000
sub*hom	4	126.017	.0000
emp*hom	2	11.213	.0037
sub*sch	8	91.286	.0000
emp*sch	4	26.214	.0000
hom*sch	8	30.101	.0002
sub*out	8	99.136	.0000
emp*out	4	32.068	.0000
hom*out	8	58.522	.0000
sch*out	16	1561.574	.0000
	First Order Effects		
sub	2	967.570	.0000
emp	1	243.003	.0000
hom	2	3295.271	.0000
sch	4	1174.945	.0000
out	4	1592.049	.0000

sub = substance emp = employment hom = home environment

sch = school activities

out = outside activities

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participation in outside activities. This result is confirmed by the table of partial chi square values presented in Table 3A. Note that the only two way interaction that is not significant is employment by home environment.

For the 1991-92 data, the best fitting model is the generating class consisting of substance by home environment by participation in school activities by participation in outside activities, employment by home environment by participation in school activities by participation in outside activities, and substance by employment by participation in outside activities. Table 3B shows the contribution of the interaction terms to the model. Note that all second order effects are in this model.

Table 4 presents the co-efficients of the interaction of substance, in this case alcohol, with each of the other factors for the data sets. For the interaction between the use of alcohol and the employment and the interaction between the use of alcohol and home environment, the coefficients almost duplicate the results found for tobacco in Table 2. The effect of employment on alcohol use is undesirable for both data sets. Having both parents present in the home has a desired effect on alcohol use since the coefficients are positive (.248 and .338) for those who do not use alcohol, and negative (-.155 and -.341) for those who do use alcohol.

A similar pattern can be found in participation in activities both in-school and outside-of-school and the use of alcohol. It is noteworthy that participation in athletics in school does not have a desirable relation to alcohol use, but participation in athletics outside of school has a desirable effect on alcohol use, since the coefficient is positive (.161) for those who participate in athletics and do not use alcohol.

Table 4
Co-efficients for Alcohol Usage

Substance/employment

	1990-91		1991-92	
	Not emp	emp	not emp	emp
Not used	.314*	-.314*	.265*	-.265*
Exp/ quit	.003	-.003	.004	-.004
Use	-.317*	.317*	-.269*	.269*

Substance/Home environment

	1990-91			1991-92		
	Parents	Parent/ step	Single Parent	Parents	Parent/ Step	Single Parent
Not used	.248*	-.086	-.162*	.338*	-.172*	-.166*
Exp/ quit	-.093*	.035	.058	.003	-.036	.033
Use	-.155*	.051	.104*	-.341*	.208*	.133

Substance/School activities

	1990-1991					1991-1992				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	-.151*	-.120	.380*	-.061	-.048	-.141	.004	.216*	-.012	-.067
Exp/ quit	.063	.046	-.091	.050	-.068	-.012	-.031	.158	.016	-.131
Use	.088	.074	-.289*	.011	.116	.153	.027	-.374*	-.004	.198

Substance/Outside activities

	1990-91					1991-92				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	.161*	.094	-.138	.156*	-.273*	.122	-.013	-.009	.070	-.170
Exp/ quit	-.059	.006	.053	-.032	.032	.057	.224*	-.325*	.008	.036
Use	-.102	-.100	.085	-.124	.241*	-.179	-.211*	.334*	-.078	.134

* Significant at the .05 level

The reverse effect on alcohol use was found for participation in music or drama organizations. In school activity participation indicated a desirable relation with alcohol usage, outside activity participation in music or drama organizations had an undesirable effect. Multiple activity participation in school activities had an indeterminant relationship on alcohol use, while multiple activity participation in outside activities tended to have a desirable effect, at least as far as the 1990-91 data indicated. The lack of participation seemed to relate to alcohol use for both in-school and out-of-school activities, although only the coefficients for the 1990-91 data for the relation between alcohol usage and outside activities was significant.

The strongest relationships seem to exist between alcohol consumption and employment and alcohol consumption and home environment. The students who are employed during the academic year or come from a home situation that does not include both parents are at a greater risk than students who are not employed or are from a home environment where both parents are present.

The activity participation is mixed, although students who are not involved in activities tend more to be involved in alcohol use.

Plots for models for the 1990-91 and 1991-92 data for observed frequencies with residuals are given in the Appendix. Both models indicate a reasonable fit with the data.

Results for Marijuana

The generating class for the 1990-91 data set involved the third order interaction terms of employment by participation

Table 5A

Partial Chi square With Marijuana

1990-1991 Data

Effect name	DF	Partial Chi sq	Prob.
Fourth Order Interactions			
sub*emp*home*sch	16	16.534	.0202
sub*emp*home*sch	16	17.353	.3631
sub*emp*sch*out	32	30.081	.5640
sub*home*sch*out	64	76.534	.1355
emp*home*sch*out	32	32.172	.4582
Third Order Interactions			
sub*emp*home	4	1.648	.8001
sub*emp*sch	8	8.622	.3752
sub*home*sch	16	17.605	.3475
emp*home*sch	8	7.653	.4681
sub*emp*out	8	6.037	.6431
sub*home*out	16	12.617	.7006
emp*home*out	8	16.069	.0414
sub*sch*out	32	45.943	.0526
emp*sch*out	16	24.958	.0706
home*sch*out	32	37.422	.2342
Second Order Interactions			
sub*emp	2	287.240	.0000
sub*hom	4	96.370	.0000
emp*hom	2	3.189	.2030
sub*sch	8	137.281	.0000
emp*sch	4	65.657	.0000
hom*sch	8	36.157	.0000
sub*out	8	154.656	.0000
emp*out	4	28.409	.0000
hom*out	8	66.299	.0000
sch*out	16	2099.373	.0000
First Order Effects			
sub	2	7246.470	.0000
emp	1	291.996	.0000
hom	2	4584.484	.0000
sch	4	1551.658	.0000
out	4	2129.565	.0000

sub = substance emp = employment hom = home environment

sch = school activities

out = outside activities

Table 5B

Partial Chi square With Marijuana

1991-1992 Data

Effect name	DF	Partial Chi sq	Prob.
	Fourth Order Interactions		
sub*emp*home*sch	16	17.279	.0202
sub*emp*home*sch	16	15.155	.5162
sub*emp*sch*out	32	49.068	.0274
sub*home*sch*out	64	82.903	.0562
emp*home*sch*out	32	58.587	.0028
	Third Order Interactions		
sub*emp*home	4	9.752	.0448
sub*emp*sch	8	7.017	.5348
sub*home*sch	16	50.457	.0000
emp*home*sch	8	3.412	.9059
sub*emp*out	8	25.581	.0012
sub*home*out	16	48.745	.0000
emp*home*out	8	8.505	.3858
sub*sch*out	32	91.552	.0000
emp*sch*out	16	45.268	.0001
home*sch*out	32	74.526	.0000
	Second Order Interactions		
sub*emp	2	138.008	.0000
sub*hom	4	99.753	.0000
emp*hom	2	14.941	.0006
sub*sch	8	93.120	.0000
emp*sch	4	36.056	.0000
hom*sch	8	16.094	.0411
sub*out	8	113.697	.0000
emp*out	4	31.510	.0000
hom*out	8	61.468	.0000
sch*out	16	1486.740	.0000
	First Order Effects		
sub	2	6404.335	.0000
emp	1	250.506	.0000
hom	2	3305.119	.0000
sch	4	1171.921	.0000
out	4	1619.792	.0000

sub = substance emp = employment hom = home environment

sch = school activities

out = outside activities

in school activities by participation in outside activities, employment by home environment by participation in outside activities, substance by home environment by participation in school activities, substance by home environment by participation in outside activities, substance by participation in school activities by participation in outside activities and home environment by participation in school activities by participation in outside activities. Also included was substance by employment. Therefore, the variable substance appears in all second order interactions. As Table 5A demonstrates, all second order interactions are significant except for employment by home environment. This would seem to indicate for this data set that there is no relationship between whether or not the student is employed and the student's home environment.

The generating class for the 1991-92 data set involved the fourth order interactions of substance by employment by participation in school activities by participation in outside activities, substance by home environment by participation in school activities by participation in outside activities, employment by home environment by participation in school activities by participation in outside activities, and the third order interaction of substance by employment by home environment. As Table 5B demonstrates, all second order interactions are significant.

The results of both data sets for second order interactions are displayed in Table 6. The patterns for both data sets are comparable. Employment has an undesirable effect on the use of marijuana. Having both parents present in the house is a deterrent to marijuana usage. These patterns are also the similar to those displayed in Table 2 and Table 4.

Table 6
Co-efficients for Marijuana Usage

Substance/employment

	1990-91		1991-92	
	Not emp	emp	not emp	emp
Not used	.314*	-.314*	.190*	-.190*
Exp/ quit	-.110*	.110*	-.078	.078
Use	-.204*	.204*	-.112*	.112*

Substance/Home environment

	1990-91			1991-92		
	Parents	Parent/ step	Single Parent	Parents	Parent/ Step	Single Parent
Not used	.301*	-.170*	-.231*	.537*	-.326*	-.211*
Exp/ quit	-.123*	.090	.033	-.145	.125	.020
Use	-.278*	.080	.198*	-.392*	.201*	.191*

Substance/School activities

	1990-1991					1991-1992				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	-.044	-.215*	.289*	.261*	-.291*	-.013	-.181	.125	.292*	-.223*
Exp/ quit	-.056	.146	-.129	.051	-.012	.091	-.023	-.101	.060	-.027
Use	.100	.069	-.160	-.312*	.303*	-.078	.204	-.024	-.352*	.250*

Substance/Outside activities

	1990-91					1991-92				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	.259*	.103	-.325*	.124	-.161	.227*	.034	-.440*	.168	.011
Exp/ quit	-.044	-.046	.077	-.179	.192	.085	-.081	.097	-.207	.106
Use	-.215	-.057	.248*	.055	-.031	-.312*	.047	.343*	.039	-.117

* Significant at .05 level

The coefficients for marijuana use with participation in activities follows the same patterns as the coefficients for tobacco and alcohol with participation in activities except that the coefficients for participation in school athletic programs were not significantly different than zero. However, participation in school music and drama groups seemed to be a deterrent to involvement with marijuana, while participation in outside music or drama organizations had the opposite undesirable effect. Students who participated in no school activities were more apt to use marijuana, while students who participated in multiple school activities were less apt to use marijuana. The lack of participation in outside activities did not show a consistent pattern across the two data sets. One result indicates an area of concern that participation in school clubs or government has an undesirable relation with marijuana use.

Again, the plots of the residuals against the observed frequencies are displayed in the Appendix. These plots suggests a good fit of the models.

Results for Cocaine

For the 1990-91 data set, the generating class contained the third order interactions of substance by employment by participation in school activities, employment by participation in school activities by participation in outside activities, home environment by participation in school activities by participation in outside activities, substance by employment by home environment, substance by employment by participation in outside activities, and employment by home environment by participation in outside activities. As the model would suggest,

Table 7A

Partial Chi square With Cocaine

1990-1991 Data

Effect name	DF	Partial Chi sq	Prob.
Fourth Order Interactions			
sub*emp*home*sch	16	13.397	.6435
sub*emp*home*sch	16	10.251	.8532
sub*emp*sch*out	32	20.141	.9488
sub*home*sch*out	64	49.455	.9096
emp*home*sch*out	32	34.243	.3605
Third Order Interactions			
sub*emp*home	4	8.868	.0645
sub*emp*sch	8	18.153	.0201
sub*home*sch	16	21.442	.1621
emp*home*sch	8	7.667	.4666
sub*emp*out	8	15.099	.0573
sub*home*out	16	19.198	.2585
emp*home*out	8	15.289	.0538
sub*sch*out	32	28.845	.6270
emp*sch*out	16	28.595	.0268
home*sch*out	32	38.136	.2104
Second Order Interactions			
sub*emp	2	45.238	.0000
sub*hom	4	53.128	.0000
emp*hom	2	11.087	.0039
sub*sch	8	37.632	.0000
emp*sch	4	84.845	.0000
hom*sch	8	45.394	.0000
sub*out	8	39.380	.0000
emp*out	4	35.339	.0000
hom*out	8	84.287	.0000
sch*out	16	2169.463	.0000
First Order Effects			
sub	2	13119.299	.0000
emp	1	295.238	.0000
hom	2	4581.089	.0000
sch	4	1551.825	.0000
out	4	2129.529	.0000

sub = substance emp = employment hom = home environment

sch = school activities

out = outside activities

Table 7B

Partial Chi square With Cocaine

1991-1992 Data

Effect name	DF	Partial Chi sq	Prob.
Fourth Order Interactions			
sub*emp*home*sch	16	7.139	.9705
sub*emp*home*sch	16	11.139	.8009
sub*emp*sch*out	32	17.694	.9808
sub*home*sch*out	64	45.894	.9575
emp*home*sch*out	32	68.615	.0002
Third Order Interactions			
sub*emp*home	4	2.463	.6514
sub*emp*sch	8	12.355	.1360
sub*home*sch	16	32.095	.0097
emp*home*sch	8	2.599	.9570
sub*emp*out	8	26.834	.0008
sub*home*out	16	32.348	.0090
emp*home*out	8	10.960	.2040
sub*sch*out	32	70.640	.0001
emp*sch*out	16	43.601	.0002
home*sch*out	32	83.307	.0000
Second Order Interactions			
sub*emp	2	18.269	.0001
sub*hom	4	55.017	.0000
emp*hom	2	25.990	.0000
sub*sch	8	47.985	.0000
emp*sch	4	30.265	.0000
hom*sch	8	25.331	.0014
sub*out	8	42.620	.0000
emp*out	4	43.112	.0000
hom*out	8	75.125	.0000
sch*out	16	1518.373	.0000
First Order Effects			
sub	2	10153.573	.0000
emp	1	235.907	.0000
hom	2	3269.372	.0000
sch	4	1184.069	.0000
out	4	1623.485	.0000

sub = substance emp = employment hom = home environment

sch = school activities

out = outside activities

all second order interactions should be significant and this is confirmed by the data presented in Table 7A.

The model for the 1991-92 data set includes the fourth order interaction of employment by home environment by participation in school activities by participation in outside activities and the third order interactions of substance by participation in school activities by participation in outside activities, substance by home environment by participation in school activities, substance by employment by participation in outside activities, and substance by home environment by participation in outside activities. Therefore, all second order interactions involving the substance cocaine should be significant. This is attested to in the data presented in Table 7B.

The coefficients presented in Table 8 again show that employment has the undesirable effect on cocaine use, although it is only significant for the 1990-91 data. A positive effect on deterring cocaine use is to have both parents present in the home.

The results for the influence of activities on cocaine use follows much the same pattern as before. Participation in school athletics seems to have no effect; participation in athletics outside the school environment has a desirable effect. Participation in music or drama groups in school does not have a significant effect on the use of cocaine, but participation in music or drama organizations outside the school has an undesirable relation to cocaine use. Interestingly, for the 1991-92 data, the lack of participation in outside activities has a desirable relation to cocaine use. As with marijuana, students who participate in school government or clubs seem more attracted

Table 8
Co-efficients for Cocaine Usage

Substance/employment

	1990-91		1991-92	
	not emp	emp	not emp	emp
Not used	.164*	-.164*	.098	-.098
Exp/ quit	-.198*	.198*	-.030	.030
Use	.034	-.034	-.068	.068

Substance/Home environment

	1990-91			1991-92		
	Parents	Parent/ step	Single Parent	Parents	Parent/ Step	Single Parent
Not used	.575*	-.274*	-.301*	.708*	-.402*	-.306*
Exp/ quit	-.215*	.129	.086	-.299*	.147	.152
Use	-.360*	.145	.215*	-.409*	.255*	.154

Substance/School activities

	1990-1991					1991-1992				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	.004	-.353*	.110	.279*	-.04	-.008	-.379*	.052	.306*	.029
Exp/ quit	-.007	.157	-.183	-.114	.133	.004	.028	-.021	-.246	.235
Use	-.011	.196	.073	-.165	-.093	.004	.351*	-.031	-.060	-.264

Substance/Outside activities

	1990-91					1991-92				
	Ath.	Club	Mus/ Dra.	> 1	None	Ath.	Club	Mus/ Dra.	> 1	None
Not used	.311*	-.111	-.359*	-.028	.187	.318*	-.193	-.540*	.096	.319*
Exp/ quit	-.187	.073	.182	-.139	.071	-.200	.020	.277	-.100	.003
Use	-.124	.038	.177	.167	-.258	-.118	.173	.263	.004	-.322*

* Significant at .05 level

to cocaine use than students who are not involved in school government or clubs.

The Appendix contains the plots for both the models of the observed frequencies with the residuals. The plots suggest the models produced fit reasonably well.

Conclusions

The students who appear most at risk for substance use are those who are employed during the academic year or those who come from homes where both parents are not on the scene. In the 1990-91 data these factors did not seem to be related, but in the 1991-92 data they were. Participation in activities may be precluded by employment. However, tobacco and alcohol use seemed to have an undesirable relation to participation in school athletic programs. On the other hand, participation in athletic programs outside the school environment had a favorable effect. Participation in school government or clubs seemed undesirable, but participation in multiple activities was desirable.

The results indicate that the the students who are at risk for substance abuse have the following characteristics:

1. The student is employed during the academic year.

2. The student comes from a home environment where both parents are not present.

3. The student is not participating in school activities.

In addition, coaches of school athletics should be aware of potential use and abuse of alcohol or tobacco among their athletes. Sponsors of clubs and student government should be aware of substance use possibilities for those who participate in these activities.

School should be a full time job for junior high and high school students. Keeping students busy with activities should be desirable.

Most important of all, students need a sense of belonging. The home environment has a very large effect. Employment is not only related to substance use, but often prevents students from becoming involved in desirable activities either in or out of school and hence the students do not have this sense of belonging. This is particularly important in the large schools of today.

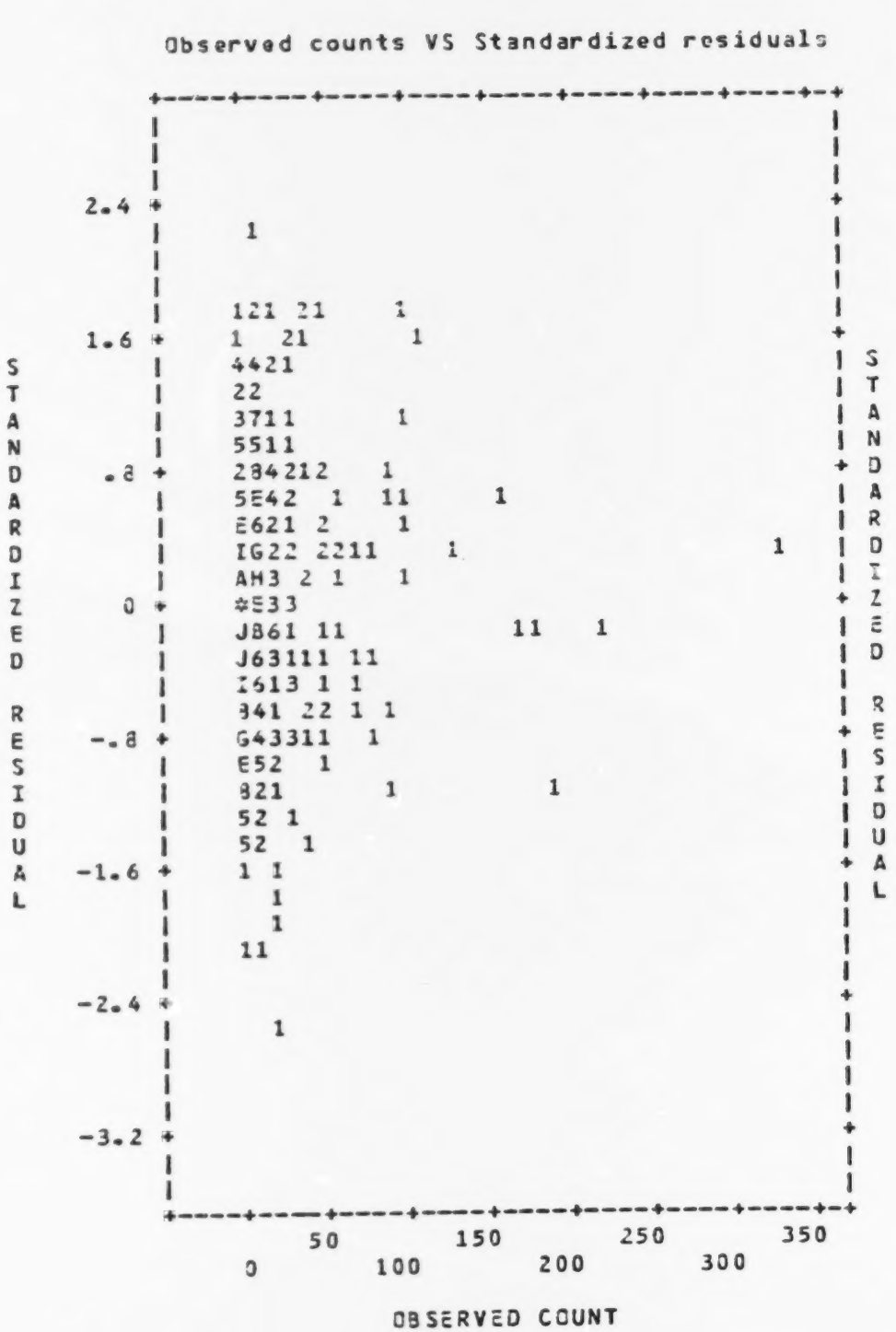
The results presented in this paper confirm the results presented in other papers by the investigators. The log-linear analysis extends the two-way classification of previous analyses of the data to a multiway classification. Even though the variables are inter-related, each of the variables of employment, home environment, participation in in-school activities and participation in out-of-school activities has an effect on substance use.

APPENDIX

TOBACCO
1991-92

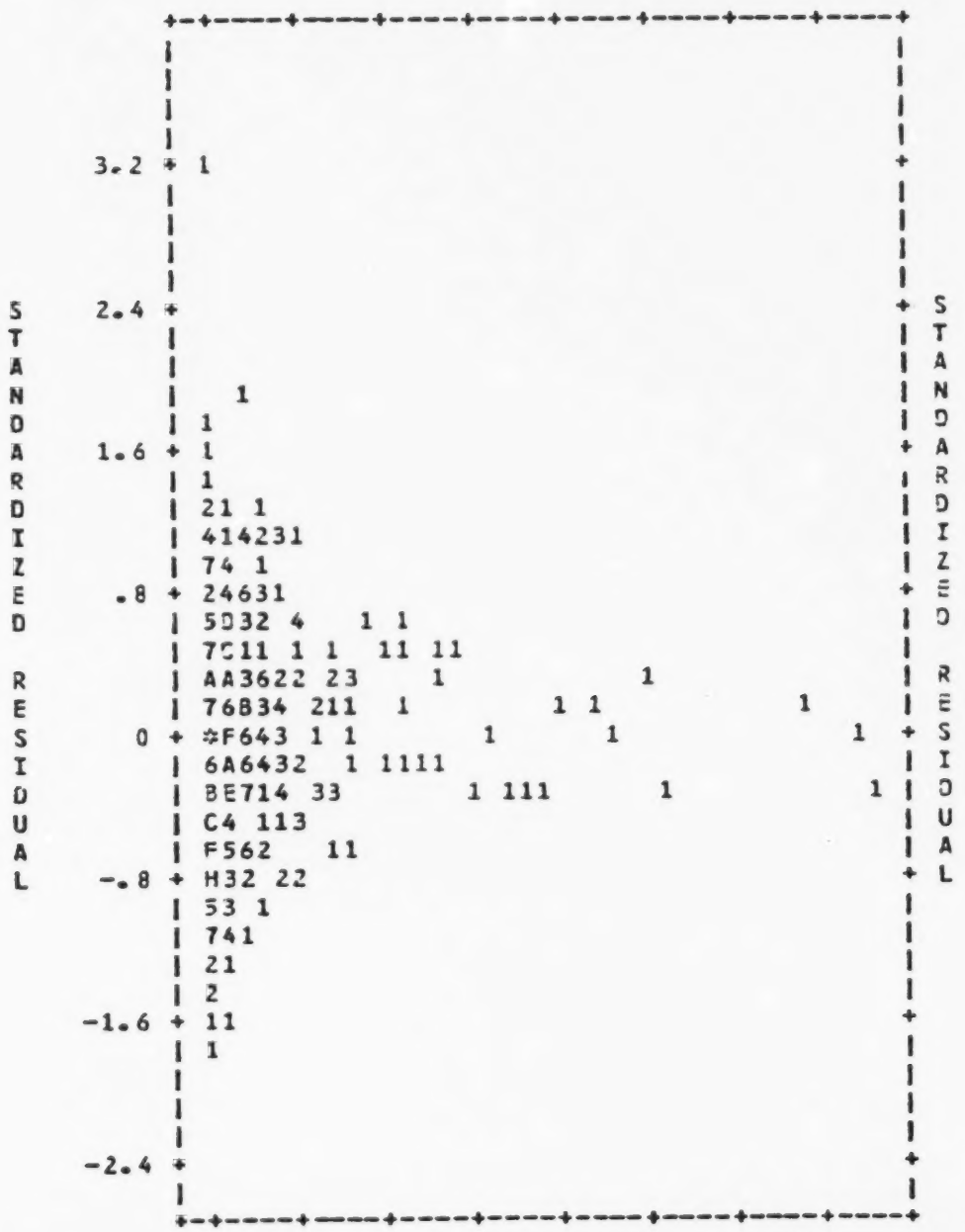
* * * \

ALCOHOL
1990-91



ALCOHOL
1991-92

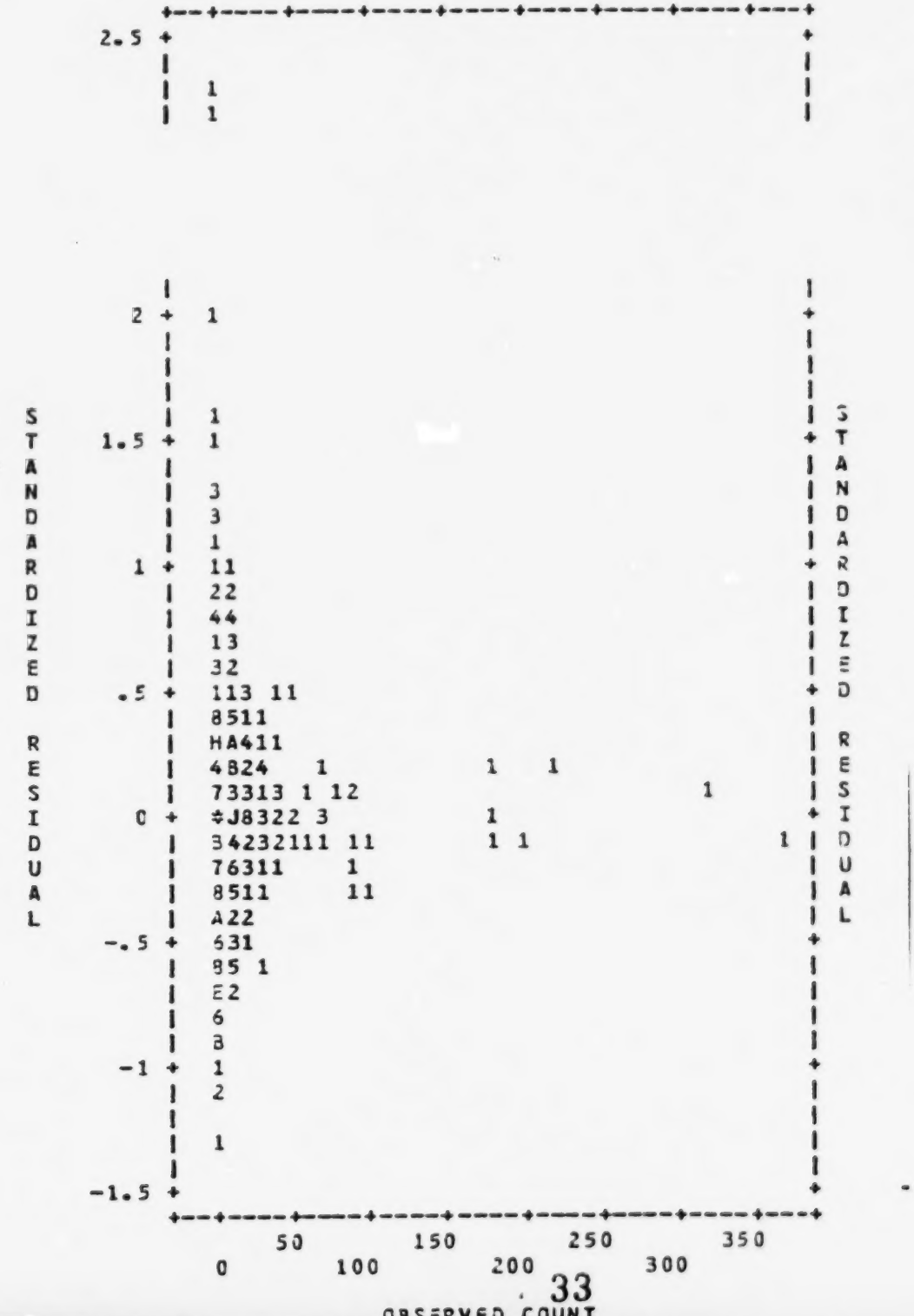
Observed counts VS Standardized residuals



MARIJUANA
1990-91

MARIJUANA
1991-92

Observed counts VS Standardized residuals



COCAINE
1990-91

COCAINE
1991-92